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Saab TransponderTech AB

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To	For information	Appendix

Long-Range Applications

The long-range applications for the AIS Class A mobile system has not been defined by any IMO requirement. The AIS Class A mobile system is prepared to serve Long-Range systems with own ship AIS data via and standardized port and with a standardized message format. The Class A mobile transponder can be used in principle with any Long-Range equipment such as HF, InmarsatC etc.. From an operational point of view a common solution should be preferable, to avoid re-connecting and re-configurations in different areas. In case of a fully integrated bridge design, where all communication systems, including AIS, are in a common network, it might be possible to use any suitable long-range communication system on request of the 'calling' authority. These thoughts are not further developed in this paper

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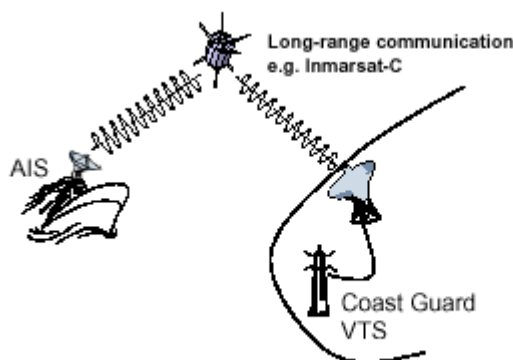The functional design of the long-range application can be as follows.

FIGURE 2

As stated above, the long-range mode requires a long-range communication medium. A maritime and/or public service provider will normally operate the long-range communication medium. Long-range AIS information exchange between that service provider and the VTS will be performed by telephone lines or other communication means.

The applicable AIS standards do not specify the nature of this long-range communication medium. Administrations are free to choose a long-range communication system that can be easily interfaced to the AIS on board and that provide cost-effective services. For example, InmarsatC terminals, which are already carried by many vessels as part of their GMDSS obligations can be candidates for this application. Also other satellite systems as well as the future UMTS service can be taken into account.

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However, most current InmarsatC terminals on board, as well as other shipborne long-range communication systems, do not support the IEC 61162-2 interface standard that has been adopted for AIS transponders and all future maritime onboard systems. Consequently, for long-range applications an active interface box is required that translates the long-range AIS 61162-2 messages to the required messages suitable for the chosen communication system and vice versa. This active interface can also gather information that may not be standard to AIS. This could be another information source on board a ship, if installed.

Figure 2. and **Figure 3** are schematic representations of the interface requirement to a long-range communication medium. **Figure 2** describes the ideal situation. However, as this ideal situation cannot be realized at this point in time **Figure 3** illustrates the recommended interim solution.
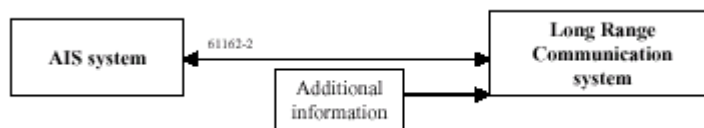

Figure 2

If no IEC 61162-2 interfaces exist for long-range communication systems, the following configuration can be used as an interim solution.
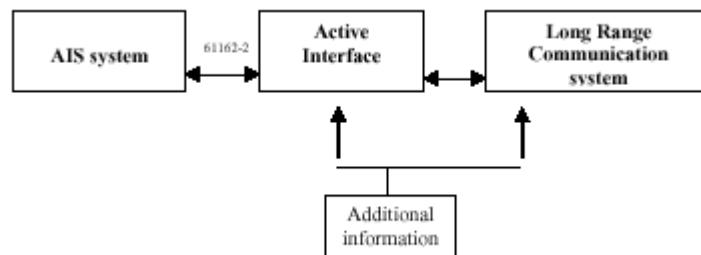

Figure 3

MESSAGES BETWEEN THE AIS AND THE LONG-RANGE COMMUNICATION SYSTEM
Standardized IEC 61162-2 interfaces on the Class A AIS units are defined to communicate with the external long-range communication system.

Interrogation of the AIS
Long-range interrogation of AIS units is accomplished through the use of two IEC 61162-1 sentences - LRI and LRF. This pair of interrogation sentences provides the information needed by the AIS unit to determine if it must construct and provide the reply sentences - LR1, LR2, and LR3. The LRI-sentence contains the information needed to determine if the reply needs to be constructed. The LRF-sentence identifies the information that is being requested. The information that can be requested by the LRF-sentence is shown in **Table 1** (AIS Long-range Communications Input Data and Formats).
Details of these sentences are contained in IEC 61162-1.

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AIS Long range Communications Input Data and Formats

Data	IEC 61162-1 Sentences
Long Range Interrogation Type of request Geographic area request AIS unit request	LRI - Long Range Interrogation
Long Range Function identification Requestor MMSI and Name Request for: Ship's name, call sign, and IMO number (A) Date and time of message composition (B) Position (C) Course over ground (E) Speed over ground (F) Destination and ETA (I) Draught (O) Ship / Cargo (P) Ship's length, breadth, and type (U) Number of persons on board (W)	LRF - Long Range Function Identification

Table 1

20.1.2 Reply of the AIS

The long-range reply of the AIS unit is accomplished through the use of three IEC 61162-1 sentence formatters - LR1, LR2, and LR3. The AIS unit shall reply with the three sentences, in the order LR1, LR2, and LR3, when responding to an interrogation - even if all the information items in the sentence are 'null'. The LR1-sentence identifies the destination for the reply and contains the information items requested by the "A" function identification character in the LRF-sentence. The LR2-sentence contains the information items requested by the "B, C, E, and F" function identification characters in the LRF-sentence. The LR3-sentence contains the information items requested by the "I, O, P, U and W" function identification characters in the LRF-sentence. The individual information items will be 'null' if any of the following conditions exist:

- The information item was not requested in the LRF-sentence,
- The information item was requested but is not available, or
- The information item was requested but is not being provided.

The output data shown in **Table 2** shall be provided when specifically requested by function identification characters contained in the preceding LRF-sentence portion of the interrogation. Details of these sentences are contained in IEC 61162-1.

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LR Output Data Formats

Data	IEC 61162-1 Sentences
MMSI of Responder MMSI or Requestor Ship's Name Ship's call sign IMO Number	LR1 - Long Range Response, line 1
MMSI of Responder Date and time of message composition Position Course over ground Speed over ground	LR2 - Long Range Response, line 2
MMSI of Responder Destination and ETA Draught Ship / Cargo Ship's length, breadth, and type Number of persons on board	LR3 - Long Range Response, line 3

Table 2

DATA EXCHANGE OVER THE LONG-RANGE COMMUNICATION SYSTEM

Because the long-range communication system is not defined nor standardized, the communication over the long-range link is not defined. To make international use of the long-range application possible, at least the communication requirements and functional design will be described here.

Requirements

The long-range communication system must comply with the following minimal requirements:

- Suitable for data communication.
- Because the long-range mode will be initiated by a general-ships broadcast message directed to a specific geographically defined area, the system must be suitable to receive geographically defined calls or at least general calls. In the last case, the AIS will select the received interrogation message.
- MMSI number will address succeeding long-range interrogations, so the receiving onboard station must be able to select on MMSI number.
- The onboard receiver must be able to distinguish AIS messages to direct them to the AIS designed I/O port.
- If the onboard system is equipped with an IEC 61162-2 interface, the communication system must transfer the long-range data message from the communication link into long-range AIS messages as defined in IEC 61162-1 and vice versa.

Functional design

The functional design for long-range communication is strongly dependent of the communication medium in use. The communication system will normally use a shell to transfer the required data messages. Measurements have to be taken for addressing the messages from the sender to the receiver. The following functional diagrams illustrate the long-range communication design.

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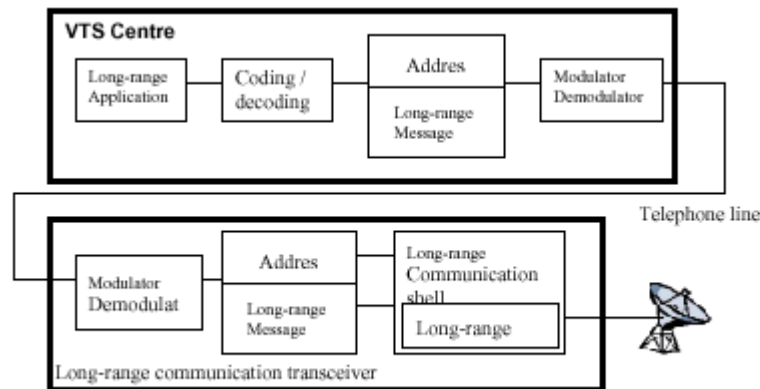| Document Id	Version	Date
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Figure 4: Shore based functional set-up

In the VTS station a long-range application will manage the long range AIS communication. Interrogations, geographical as well as addressed, will be coded to long-range messages together with the belonging addresses. Via telephone lines these information will be transferred to a long-range transmitter/receiver station (e.g. an InmarsatC earth station). For the air transportation a communication shell will be required, depending of the communication system to be used. The long-range data and the address information are just elements of that shell.
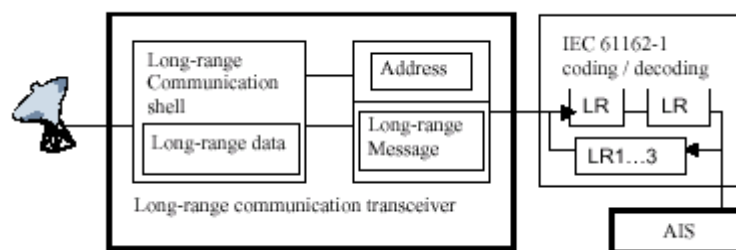
5: Functional set-up onboard

After receiving the message onboard, the long-range message and address information will be decoded from the shell. Now it is clear that the information is addressed to that particular vessel and its AIS system. The coding and decoding to IEC 61162-1 format of the long-range message can be an integral part of the long-range communication transceiver or a separate unit as given in **Figure 3.** The AIS system will upon reception of the long-range interrogation message create a reply, which is sent to the connected Long-Range equipment for transfer to the interrogating shore authority (VTS).